

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
International Comparison and Consumer)	
Survey Requirements in the Broadband)	
Data Improvement Act)	GN Docket No. 09-47
)	
A National Broadband Plan for Our Future)	
)	
Inquiry Concerning the Deployment of)	GN Docket No. 09-51
Advanced Telecommunications Capability)	
to All Americans in a Reasonable and)	
Timely Fashion, and Possible Steps to)	
Accelerate Such Deployment Pursuant to)	
Section 706 of the Telecommunications Act)	GN Docket No. 09-137
of 1996, as Amended by the Broadband)	
Data Improvement Act)	

Comments – NBP Public Notice # 2
Alvarion, Inc.

Alvarion, Inc. (“Alvarion”) submits these comments in response to a National Broadband Plan Public Notice,¹ in which the Federal Communications Commission (“FCC” or “Commission”) seeks input on “a plan for the use of broadband infrastructure and services in advancing . . . energy independence and efficiency.”² The FCC seeks comments on many facets of Smart Grid technology. Alvarion, a developer of innovative WiMAX and wireless broadband network solutions, focuses its comments on the types of communications networks and technologies that best support Smart Grid applications, the sufficiency of existing communications networks and whether they are suitable for Smart Grid applications and, most importantly, why wireless spectrum and WiMAX is the best technology for Smart Grid deployments. The Commission should consider wireless broadband technologies as an essential tool to help achieve efficient implementation of Smart Grid technology.

¹ *Comments Sought on the Implementation of Smart Grid Technology*, NBP Public Notice # 2, GN Docket Nos. 09-47, 09-51, 09-137 (September 4, 2009).

² American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 6001(k)(2)(D), 123 Stat. 115 (2009) (Recovery Act).

I. BACKGROUND.

Alvarion designs, develops and deploys innovative WiMAX and wireless broadband network solutions around the world which enable personal, portable and mobile broadband that improve productivity and lifestyle choices. WiMAX is cost-effective, reliable, and scalable for consumers and small businesses. WiMAX can be readily extended to Smart Grid applications. Alvarion is a founding member of the WiMAX Forum and has contributed significantly to developing and commercializing WiMAX. Alvarion is traded on NASDAQ and is the largest WiMAX manufacturer in the world with the most extensive WiMAX customer base. Alvarion's first WiMAX equipment was certified four years ago and several WiMAX products have been certified, commercially available and extensively deployed since that time. Alvarion received Buy American domestic acceptance from the Department of Agriculture's Rural Utilities Service in July of 2008. Alvarion was the first vendor to receive this approval for its 802.16e BreezeMAX platform which operates at 2.3 GHz and 2.5 GHz.³ Alvarion recently received Buy American acceptance for its BreezeMAX 3650 platform. With more than 250 commercial WiMAX networks deployed worldwide in over 100 countries,⁴ Alvarion's WiMAX base stations are the world's most-deployed WiMAX radio access network equipment.⁵

Alvarion's WiMAX solution portfolio provides complete and optimized broadband wireless connectivity solutions for distribution networks within the Smart Power Grid. Alvarion's broadband wireless Smart Grid applications can enable advanced hybrid deployments that meet Smart Grid emerging needs to enhance control, efficiency, reliability and safety through a compelling technical solution.

II. WIRELESS NETWORKS & TECHNOLOGIES ARE SUSTAINABLE, SCALABLE & FLEXIBLE FOR SMART GRID APPLICATIONS.

³ See Press Release, Alvarion, Inc., Alvarion's BreezeMAX Receives USDA's WiMAX Rural Development Acceptance for 3.65 GHz Frequency (April 1, 2009), <http://www.alvarion.com/presscenter/pressreleases/182435/>.

⁴ The operators that Alvarion works with in these countries include: Telkom South Africa, Enforta (Russia), Iberbanda/Telefonica (Spain), Altitude Telecom (France), Cable and Wireless, WiMAX Telecom (Austria), Aircell (India), Elro (Denmark), Access Kenya, Racsa (Costa Rica), Telmex (Mexico), Ertach (Argentina), Kenya Data Networks.

⁵ Press Release, Alvarion, Inc., Alvarion Demonstrates the Latest in 4G Wireless Broadband at Mobile World Congress (Feb. 12, 2009), available at <http://www.alvarion.com/presscenter/pressreleases/180767/>. Wireless broadband and voice connectivity solutions offered by Alvarion for fixed, nomadic and mobile communications have already been deployed by service providers which include Bharti, MTN Uganda, Telecom Namibia, Digicel, TDS, Mainstreet Broadband and many others.

In this inquiry, the FCC seeks to better understand which communications networks and technologies are suitable for the multitude of Smart Grid applications, keeping in mind latency limitations and bandwidth requirements. Alvarion urges the Commission to consider wireless broadband technology like WiMAX as a sustainable network option for Smart Grid applications. In Alvarion's view, wireless broadband technology is the most technologically advanced platform for achieving efficient implementation of Smart Grid technology broadband service to the entire country, including rural and remote areas. Wireless, in particular WiMAX, is the only technology available today that can address all the applications required in a Smart Grid network environment: mobility and fix connectivity; low-latency broadband access; voice and video application with quality of service (QoS) and security support; mobility and nomadic connectivity.

A Smart Grid network is a combination of a Wide Area Network (WAN) and Local Area Networks (LANs). The distribution segment of any grid network traverses multiple states and is a Wide Area Network by nature. The WAN is connected to the LANs that service the various Smart Grid applications. Alvarion's WiMAX broadband wireless connectivity solutions are sustainable, reliable, scalable, secure, flexible, and affordable for both WAN and LAN Smart Grid network requirements.

The WAN, as the hub of the Smart Grid distribution network, must be designed to meet a wide range of application connectivity requirements, including low-latency required to control in real-time remote devices, as well as bandwidth requirements addressing "bandwidth thirsty" applications, such as video surveillance and work force communication, as listed below.

Communication Type	Latency	Description
Positive Control	<50 msec	Critical Distribution Automation devices
Monitoring	<500 msec	Monitor of SCADA devices
Alert & Alarm	<1000 msec	Video Surveillance
Bulk Data	>1000 msec	Smart Meter reading

Alvarion believes that a WAN network for Smart Grid should be a 4G carrier class network with point to multipoint topology that ensures nationwide coverage, supporting triple-play (data, voice, video) broadband services, and real-time transmission. The use of voice on

the private network allows for redundancy of this critical communication during emergency events like those the Nation has seen in the recent past. The WAN for Smart Grid should provide connectivity to the LANs as well as to distribution automation devices and mobile work force. It also should be capable of backhauling LAN applications and for providing core connectivity.

The following types of wireless technologies should be considered for Smart Grid WAN applications:

- *WiMAX*: WiMAX is an ideal wireless technology for Smart Grid applications. WiMAX is currently the only commercially available 4G network. It provides the reliability, scalability, security, standards and meets the necessary broadband, low latency, QoS and mobility requirements. The cost of a WiMAX solution is very much dependent on the cell radius of the vendor's WiMAX base station equipment. WiMAX deployments require a lower capital expenditure investment compared to Wi-Fi Mesh solutions because of the lower number of required base stations. While one WiMAX base station may cover an area of 10-50 square miles, 40 Wi-Fi access points would be required to cover a single square mile. Alvarion provides WiMAX solutions in licensed (2 GHz, 3 GHz), quasi-licensed (3.65 GHz) and unlicensed (5 GHz) bands.
- *Cellular*: Cellular technology could be used for Smart Grid applications and could provide an intermediate backhauling solution for Advanced Metering Infrastructures (AMI) networks. However, cellular technology does not provide the low latency and QoS required by Smart Grid applications, nor the bandwidth requirements for video surveillance and future bandwidth savvy grid applications. Cellular networks do not meet the reliability requirements since they were designed as a commercial infrastructure serving the requirements of mobile device users rather than utilities that need to communicate with critical grid devices. This lack of reliability could be seen when there were large emergency events that brought those systems down due to extreme over-subscription of the providers and lack of redundant power delivery to those sites made them useless for weeks. The cost of a cellular network is dependent on the price set by the operator, but the cost could be as high as \$40 a month per connection, and could result in a multi-million dollar operating expenditure.
- *Wi-Fi Mesh*: AMI vendors are trying to climb up the value chain and offer their Wi-Fi Mesh solutions as a grid WAN infrastructure. Wi-Fi Mesh may be suitable for LAN applications in the Smart Grid, but Alvarion opposes use of mesh technology for the WAN applications because Wi-Fi is a license exempt frequency that suffers from interference and cannot meet the latency requirements of all types of distribution automation devices. The deployment costs and complexity of Wi-Fi are very high and therefore not recommended in any case.
- *Proprietary*: Wireless solutions based on proprietary implementation as well as solutions providing connectivity in unlicensed frequencies (900 MHz, 4.9 GHz – 5.8 GHz) differ significantly from the proposed standard WiMAX solution. Only standard licensed solutions can deliver the reliability, security, coverage, and QoS required to assure successful deployment and service delivery.

For purposes of Smart Grid, wireless LAN networks will typically provide connectivity to smart meters, substation premises and mobile workforce at certain locations, and could be implemented with the following wireless technologies:

- *Wi-Fi Mesh*: Wi-Fi Mesh is a common solution for smart meter connectivity, substation premises and mobile workforce at certain locations.
- *Zigbee*: Zigbee is suitable for smart meter connectivity due to its good penetration and the low need for bandwidth. However, Zigbee suffers power limitations because it utilizes the same frequency band as home access points and resides in the unlicensed band also utilized by unlicensed WISPs providing broadband to end-users. Also, Zigbee does not meet the requirements of other LAN networks because it requires higher bandwidth and devices that do not support the Zigbee standard.

Only a 4G wireless, carrier-class network, like a WiMAX network, can support the proper connectivity of LAN networks and the proper connection of LAN networks to the WAN for Smart Grid deployments.

Finally, to achieve efficient implementation of a Smart Grid throughout the United States, which has a diverse topography and often challenging propagation, Alvarion believes that mobile WiMAX technology, with its open standards and all-IP architecture, its high-capacity, wide coverage, and its QoS, is best suited to address the energy needs of the whole nation. An important benefit of Alvarion's version of WiMAX, "Open WiMAX", is the disruptive operator-centric culture that the Open WiMAX standard. Typically, equipment vendors have chosen to be standards-based, but then choose to develop particular solutions with the goal of controlling the interfaces and interoperability of their standards-based solutions in a closed environment. Such an environment is not always a best fit for the needs of the service provider, as it creates a high dependence on the selected vendor. Unlike the traditional model of "one vendor does it all" philosophy,⁶ Alvarion's Open WiMAX is focused on an open IP-based Internet model. With Open WiMAX, private and public operators and utilities that are pursuing Smart Grid solutions will have the ability to choose the combination of vendors and partners that best fit their specific requirements and achieve the benefits that open access and interoperability will bring to the service provider's cost structure and operating efficiencies.

⁶ Open WiMAX is an all-IP open architecture for WiMAX access networks, which is endorsed by the WiMAX Forum™ and complies with the WiMAX Forum's Networking Work Group (NWG) specifications, and is designed as an open, standardized, interoperable technology. Alvarion's Open WiMAX solution is a complete ecosystem based on three fundamentals: scalability, making it equally suitable for large, medium or small deployments; cost optimization, allowing operators to control network deployment costs; and application driven, enabling simple integration with third party applications and services.

III. CURRENT COMMERCIAL NETWORKS ARE NOT SUFFICIENT FOR EFFICIENT SMART GRID IMPLEMENTATION.

Since commercial public networks were designed as a commercial infrastructure rather than a critical infrastructure, current commercial public networks do not meet the full requirements for Smart Grid applications or networks. Current commercial public networks do not implement 4G technology and therefore do not have the bandwidth, QoS and low latency required by Smart Grid applications. Some public operators claim they plan to deploy LTE within the next several years, but their focus will remain on building a commercial network rather than a mission critical network. Public operators alone will never have an adequate network infrastructure to serve the fast growing Smart Grid connectivity requirements. Some examples of issues that utilities may experience if they use a public operator for WAN connectivity are outlined below.

- *Availability.* The network may not be available in case of a natural disaster or a terror attack, since the network will collapse as a result of over use by mobile users. The network will also not be available at the time of an outage, when the utility needs it most to manage it.
- *Reliability.* Public operators do not differentiate between the types of service provided to different types of users. An SMS (text message) command sent to a critical Smart Grid device may be delayed due to an SMS sent between two teenagers.
- *Coverage.* Part of a utility provider's service area may not be covered by an operator due to lack of mobile users and financial benefit. This provides an example of how commercial interests of a public network can conflict with the requirements of a mission critical utility network.
- *Cost.* As utility providers deploy Smart Grid applications, the network will become a critical component of the Smart Grid. If utility providers do not own the network infrastructure, they will not be able to control the Grid costs which will in turn expose utility providers to unexpected expenses of increased costs.

Private, not commercial, WiMAX networks are the best solution for nationwide Smart Grid implementation because of the reliability, sustainability, and high-quality of service coupled with the low-cost of deployments. WiMAX also is ideal for Smart Grid deployments that need to reach rural areas at a reasonable cost compared to wired (copper or fiber optic) infrastructure. In Alvarion's view, wireless broadband deployments are the "now" and the "future" of efficient Smart Grid technologies and applications.⁷

⁷ See Philip J. Weiser, *A Framework for a National Broadband Policy*, Aspen Inst. (2008) at 22 (quoting Professor Werbach), available at <http://www.aspeninstitute.org/policy-work/communications-society/programs-topic/communications-policy/roundtable-spectrum-policy-a>. "Bolstering this argument, one study conducted by industry veterans suggests that WiMAX, 'if deployed and marketed correctly, is a truly disruptive technology that could unseat the telco-cable duopoly and provide consumer choice in broadband services.'" *Id.* (quoting Carol Wilson, *WiMAX Truly Disruptive if Marketed Well, Study Says*, Telephony Online, July 23, 2007, available at

IV. SPECTRUM IS A CRITICAL COMPONENT OF ANY SMART GRID DEPLOYMENT; WiMAX CAN HELP OVERCOME IMPEDIMENTS TO WIRELESS SMART GRID APPLICATIONS

A. Licensed, Lightly-Licensed & Unlicensed Spectrum are all suited for Smart Grid Applications, But Only When They are Coupled with WiMAX.

When using WiMAX technologies, all types of spectrum are a viable option for Smart Grid deployments. Licensed WiMAX frequencies, available in the 2 GHz band, are the most cost effective solution for wireless broadband and Smart Grid applications, even in hard to reach rural areas. Unfortunately, many utilities have been reluctant to use this spectrum for fear of commercial infrastructure priorities conflicting with utility critical infrastructure concerns. WiMAX in 3.65 GHz spectrum is becoming common among utilities, as it minimizes interference issues of unlicensed frequencies while avoiding the high cost of licensed WiMAX frequencies. The key limitation of using WiMAX in 3.65 GHz spectrum is the existence of exclusion zones mandated by earth stations that are typically located in parts of the east and west coast. To overcome this limitation, the FCC should consider providing alternative unlicensed frequencies (900 MHz, 4.9-5.8 GHz) for Smart Grid technologies in the specific exclusion zones.

Unlicensed spectrum (900 MHz, 2.4 GHz) is also suitable for Smart Grid implementations, specifically for AMI networks and some distribution automation devices. It is also viable for the WAN infrastructure, but only when using WiMAX. Interference is an issue that can cause disconnections and impact the Grid reliability. Fortunately, Alvarion's OFDM NLOS technology and interference mitigation techniques address the interference and non-line of site issues. The WiMAX management platform is a key component of managing interference issues by proactively managing the network infrastructure.

B. Smart Grid Technologies Need Sufficient Bandwidth For Broadband Connectivity and Throughput Requirements.

In addition to interference concerns, spectrum allocation, throughput, latency, coordination, and security should all be considered when deciding the type of spectrum best suited for Smart Grid applications. Regardless of whether the spectrum is licensed or unlicensed, the FCC should provide spectrum for Smart Grid technologies with enough channel width to allow for broadband connectivity. Any frequency that can be supported by

http://telephonyonline.com/wimax/technology/wimax_disruptive_study_072307.

the WiMAX standard will meet the requirements. In order to achieve ubiquitous penetration, the FCC should allocate spectrum below the 2 GHz band to streamline deployments of Smart Grids. The network infrastructure is a key component in Smart Grid deployment. Utilizing coordination between Canada and what the U.S. has allocated for utility usage will prevent interference issues at the borders along with a wider selection of available products since the market for Smart Grid devices will be larger.

Throughput (or bandwidth) requirements differ among Smart Grid applications, going from less than 1 kbps to over 1 Mbps. Many of the current Grid applications require less than 100 kbps; however their collectors, like in the case of AMI, may require over 1 Mbps. If the data from the Grid devices need to be collected during a very short period of time (at the end of the day) in order to be processed by a data warehouse business application, the throughput requirements may increase as well. Video surveillance applications, that are becoming part of the Smart Grid to protect critical assets, already require 1-2 Mbps for each camera, depending on the required resolution and number of frames/second.

Future Grid applications will require higher bandwidth, in the same manner that the Internet throughput requirements increased dramatically from the days of the initial textual email applications to what we experience today. New home area applications serving the utility customers will require significantly more bandwidth from the homes, compared to the low bandwidth required by the smart meters today. Since the Grid network infrastructure is built for many years to come, it only makes sense to build it using a scalable infrastructure. Current UHF, VHF and 800 MHz solutions cannot provide today's Grid throughput requirements. Wireless broadband solutions, like WiMAX, are future-proofed and can be easily upgraded to include additional system capacity or instantly upgrade the software for the entire Grid, enhancing performance of the system without the need to dig up streets and upset the environment.

C. The Use of Private WiMAX Networks Increase Security and Support Low Latency Smart Grid Applications.

The Smart Grid WAN infrastructure must support the low latency Grid applications. Commercial networks do not support the low latency applications (<100ms) nor do they provide the required QoS. A utility provider deploying a private WiMAX network can achieve low latency which is less than the required 100ms. Also, a utility owned private network can control and

manage the security level it requires. As the Grid becomes more digital and connected, securing its network becomes more important.

D. To Ensure the Greatest Success of Smart Grid Deployments, the FCC Should Allocate One Unified Spectrum Band.

Coordination is a key element of any Smart Grid network. Utility companies' service areas span states and countries. Because of the vast area a Smart Grid network will cover, the FCC should allocate one unified spectrum band (such as 1.8 GHz across Canada) to serve all utility providers. In case of crisis, when crews from one state support the infrastructure of another state, they should be able to use the same communication devices and systems that may relay on a unified, interoperable network. A unified spectrum allocation will facilitate efficiency and cost-effectiveness in the utility industry, as there will be no need to develop multiple network interfaces across industries or multiple spectrum bands.

V. CONCLUSION.

Alvarion believes that mobile broadband technologies like WiMAX will unquestionably play a central role in achieving the Commission's list of public policy goals when developing the National Broadband Plan, including implementation of a Smart Grid. Private WiMAX networks are the best solution for nationwide Smart Grid implementation because of the reliability, sustainability, and high-quality of service coupled with the low-cost of deployments. When considering the use of broadband infrastructure and services in advancing energy independence and efficiency, the Commission should view wireless broadband technologies like WiMAX as an essential tool for Smart Grid deployments.

Respectfully submitted,

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